# IBM

## MST-2
## Module Data



**IBM Confidential**

This pocket-size document has been published as a
reference design handbook for users of the MST-2
circuit family.  It contains a summary of informa-
tion on the MST-2 family and is intended to serve as
a reference supplement of the MST-2 Circuit Opera-
tion Book 03-08,

The complete MST-2 module set is presented as it
appears at the time of publication of this document.
This document will be revised on a periodic basis to
insure an accurate and current content.

Any questions concerning the content of this docu-
ment should be directed to MST Circuit Applications,
Department  789, IBM  East Fishkill.

Distribution of this document is on a need-to-know
basis, controlled by the Circuit Technology Managers
at their location.

## II. GENERAL

MST-2 provides a system designer with a versatile
monolithic circuit family having a typical "pack-
aged" performance of 6 - 8ns.

A high packaging density is achieved by the use of
integrated circuit chips on 16 pin SLT modules and
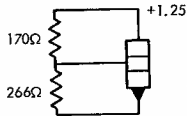"SLT-like" cards with improved wireability.

Improved second level packaging is achieved by
double layer boards and direct wiring via Tri-lead
cable.

The basic circuit family utilizes a +1.25V and -3V
power supply.

BASIC MST-2 CIRCUIT



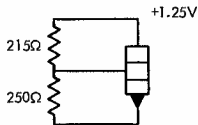$G = \overline{F} = \overline{A+B+C+D}$
OUT OF PHASE OUTPUT

$F = A+B+C+D$
IN PHASE OUTPUT
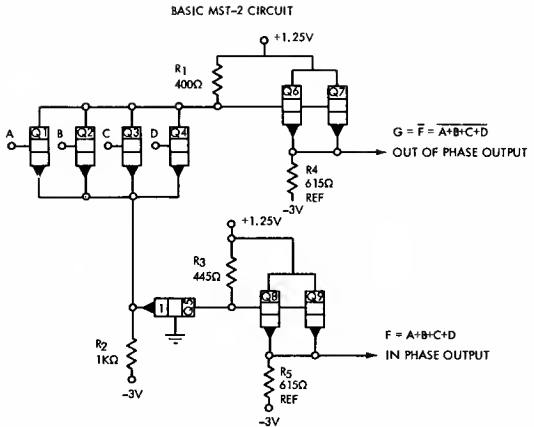
When the out-of-phase clamp is used $R_1$ is replaced by network:



When the in-phase clamp is used $R_3$ is replaced by network:
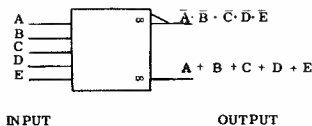


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# IV.   OUTPUT LEVELS

Voltage Levels

MPUL .675V

LPUL .230V

LNDL -.240V

MNDL -1.260V

### A. Current Switch



INPUT  OUTPUT

The block notation represents the basic current switch function and, unless otherwise noted within the block, is considered to perform the OR function. The presence of an infinity sign within the block implies no clamp circuit at the adjacent output.
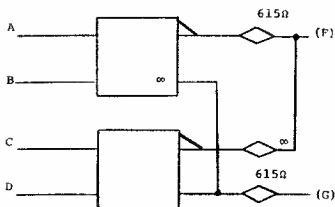
### B. Emitter Follower



As the MST-2 circuits may be internally collector dotted to perform the AND function, the diamond symbol is employed to distinguish between collector and emitter dots and the presence or lack of an emitter follower at the block output.

### C. Emitter Follower Load State
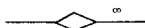


The symbol adjacent to the diamond denotes the load state of that emitter follower, e.g., $\infty$ implies an unloaded emitter, 615 $\Omega$ implies an emitter loaded internally with 615 $\Omega$ .

### D. Dot Functions



The dotted connection outside the emitter follower represents the DOT-OR connection, e.g.

$$F = \overline{A}\overline{B} + \overline{C}\overline{D}$$

The dotted connection inside the emitter follower represents the collector DOT-AND function, e.g.

$$G = (A + B)(C + D)$$

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# VI.  MODULE PIN NUMBERING



Top View

| Module P/N | Description |
|---|---|
| 253 1829 | 6(2w$\overline{\emptyset}$) |
| 253 1830 | 3(3w$\overline{\phi}$) |
| 254 1831 | 3(3w$\phi$) |
| 253 1832 | 2(4w both $\phi$) |
| 254 1833 | 3(2-3wAO) $\overline{\phi}$ |
| 255 1836 | 4(4w$\phi$) |
| *254 1835/255-1858 | (2-4w,1-3w) AO both $\phi$ |
| 255 1836 | 3(2-Turn On Polarity Hold) |
| *253 1837/255-1860 | 2(3-Turn On Polarity Hold) |
| 254 1838 | 4-(Exclusive OR) |
| 255 1839 | 3(2-2w AO Latch) |
| 253 1840 | 6(2w$\overline{\phi}$) |
| 254 1841 | 1(2-3w AO) both $\phi$,1(2-2w AO) $\phi$ |
| *255 1844/255-1857 | (3-3w,1-4w) AO both $\phi$ |
| 255 1845 | 3-3w both $\phi$ |
| 254 1846 | [1(2-2w) AO, 1(1-2w,1-3w) AO] both $\phi$ |
| 253 1847 | 2-3w$\phi$, 1-4w$\phi$ |
| 254 1848 | 6(2w$\phi$) |
| 253 1849 | 2-Exclusive Or Latch |
| *255 1850/255-1859 | (3-4w,1-3w) AO both $\phi$ |
| *253 1851/255-1861 | (4-3w) AO, 2w$\overline{\phi}$ |
| 255 1852 | 2-D.C. Trigger |
| 254 1853 | 3(2-3w AO) $\overline{\phi}$ |
| 255 1854 | (4) Polarity Hold |
| 253 1855 | 2 4w OE Parity Tree |
| 254 1856 | 3(3w both $\phi$) |

Logic Support Module Set

| Module P/N | Description |
|---|---|
| 254 1646 | Multi-Purpose $\phi$ CS |
| 253 1647 | Multi-Purpose $\overline{\phi}$ CS |
| 255 1648 | MST-1 to MST-2 Converter 3-2w$\overline{\phi}$, 1-2w both $\phi$ |
| 255 1649 | MST-1 to MST-2 Converter 2-4w both $\phi$ |
| 255 1650 | MST-2 to MST-1 Converter |
| 255 1651 | NPL/SLT to MST-1/MST-2 Converter |
| 255 1652 | Single Shot |
| 255 1654 | 2-A.C. Trigger |
| 255 1655 | 3-A.C. Trigger |
| 255 1656 | A.C. Trigger |
| 239 5143 | MST-1/MST-2/to SLD Converter |
| 255 1658 | CS to SLT/NPL Converter |
| 255 1665 | MST-1 to MST-2 Converter 3-2w$\phi$, 1-2w both $\phi$ |
| 255 1899 | Multi-Purpose In-Phase CS [4(2w$\phi$)] |

* Second part number is selected module
  for faster speed.  Refer to section 9
  of document D98a.

VII. (A) MS-101 Module Chip Cross Reference

| Module P/N | Chip P/N | |
|---|---|---|
| 253 1830 | 2393 830 | |
| 254 1831 | 2393 831 | |
| 253 1832 | 2393 832 | |
| 254 1833 | 2393 833 | |
| 255 1834 | 2393 834 | |
| 254 1835 | 2393 835 | |
| 255 1836 | 2393 836 | |
| | 2393 900 | |
| 253 1837 | 2393 837 | 2 Chip per Module |
| 254 1838 | 2393 838 | |
| 255 1839 | 2393 839 | |
| 253 1840 | 2393 840 | |
| 254 1841 | 2393 841 | |
| 255 1844 | 2393 844 | |
| 255 1845 | 2393 845 | |
| 254 1846 | 2393 846 | |
| 253 1847 | 2393 847 | |
| 254 1848 | 2393 848 | |
| 253 1849 | 2393 849 | 2 Chip per Module |
| 255 1850 | 2393 850 | |
| 253 1851 | 2393 851 | |
| 255 1852 | 2393 852 | 2 Chip per Module |
| 254 1853 | 2393 853 | |
| 255 1854 | 2393 854 | 2 Chip per Module |
| 253 1855 | 2393 855 | 2 Chip per Module |
| 254 1856 | 2393 856 | |
| 255 1899 | 2393 899 | |

VII. (B) Module Power Dissipation and Max Can Temp.

| Module P/N | Power Dissipation (mw) MS 101 | # Circuits | Max. Can Temp. °C MS 101 |
|---|---|---|---|
| 253 1829 | 123 | 7 | 76 |
| 253 1830 | 91 | 3 | 77 |
| 254 1831 | 61 | 3 | 79 |
| 253 1832 | 88 | 2 | 78 |
| 254 1833 | 75 | 6 | 78 |
| 255 1834 | 122 | 4 | 76 |
| 254 1835 | 70 | 3 | 79 |
| 255 1836 | 269 | 13 | 74 |
| 253 1837 | 178 | 10 | 76 |
| 254 1838 | 159 | 8 | 74 |
| 255 1839 | 182 | 6 | 73 |
| 253 1840 | 213 | 7 | 71 |
| 254 1841 | 101 | 4 | 77 |
| 255 1844 | 110 | 5 | 77 |
| 255 1845 | 64 | 3 | 79 |
| 254 1846 | 122 | 4 | 76 |
| 253 1847 | 91 | 3 | 77 |
| 254 1848 | 213 | 7 | 71 |
| 253 1849 | 239 | 12 | 75 |
| 255 1850 | 80 | 4 | 78 |
| 253 1851 | 222 | 8 | 71 |
| 255 1852 | 365 | 12 | 72 |
| 254 1853 | 119 | 6 | 76 |
| 255 1854 | 281 | 12 | 74 |
| 253 1855 | 311 | 16 | 73 |
| 254 1856 | 154 | 3 | 74 |
| 255 1899 | 75 | 4 | 78 |

P/N 2531829

$6(2w\bar{\phi})$
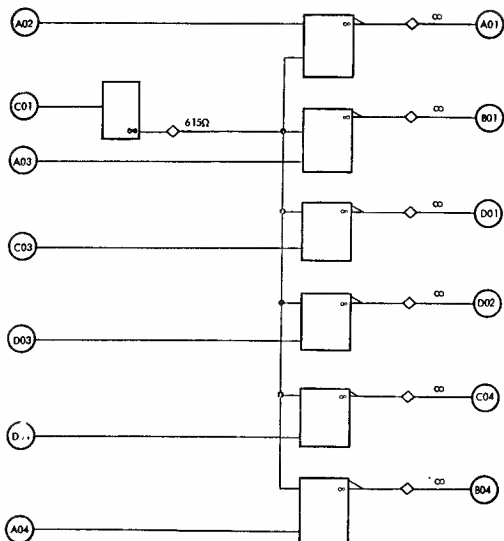


Same as P/N 2531840, without emitter resistors

Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | – 2400518 |
| B03 | +1.25V | Combined | – NA |
| C02 | GND | Basic | – ALAA8, ALAAø |

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P/N 2531830          3(3w$\overline{\phi}$)



| | | |
|---|---|---|
| B02 | -3V | Module |
| B03 | +1.25V | Combined |
| C02 | GND | Basic |
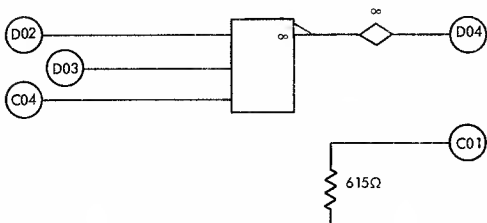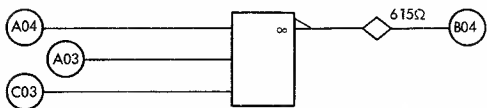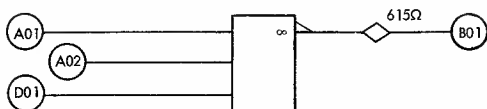
Circuit Flyers

Module   - 2413876
Combined - NA
Basic    - ALAA8
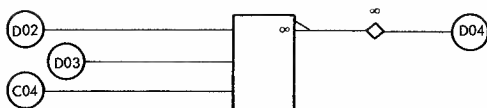         - ALAA0
         - ACARE

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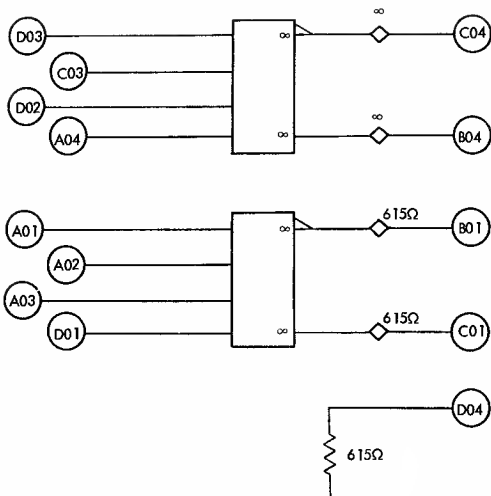
3(3w$\overline{\phi}$)
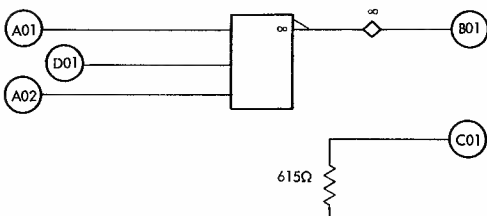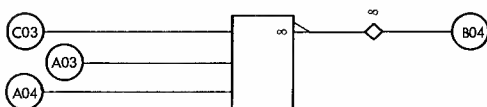


Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

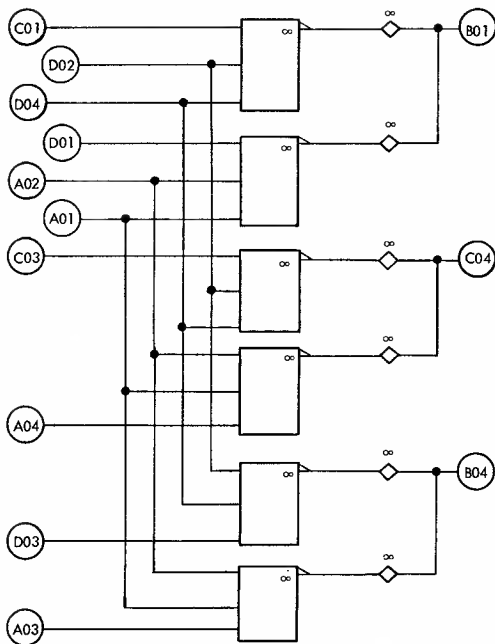Module  - 2413877
Combined - NA
Basic   - ALAA0
        - ACARE

2(4w both φ)



Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | - 2413878 |
| B03 | +1.25V | Combined | - NA |
| C02 | GND | Basic | - ALAA0 |
| | | | - ALAA8 |
| | | | - ACARE |

3(2-3w AO) $\bar{\phi}$



Circuit Flyers

| | |
|---|---|
| B02 -3V | Module - 2413879 |
| B03 +1.25V | Combined - AMA20 |
| C02 GND | Basic - ALACA |
| | - ALAAC |

Notes for P/N 2551834

Pins AØ2 and CØ3 actually go to 4 bases. Design
Automation, however, has been told (via flyer) that
these pins represent only 3 bases each.

This representation is valid for AC wiring rule
implementation only, and then only when certain
conditions are fulfilled. It is the responsibility
of the logic designer to assure himself that:

1) Counting these pins as four loads each, there
   are not more than ten loads on the nets in-
   volved, AND

2) During the time that either pin is going up
   (or down) in voltage, the other module inputs
   are so conditioned that pin AØ2 or pin CØ3
   turns on (or off) not more than one of the four
   circuits on the module. A circuit is on when
   any one of its out-of-phase (input) transistors
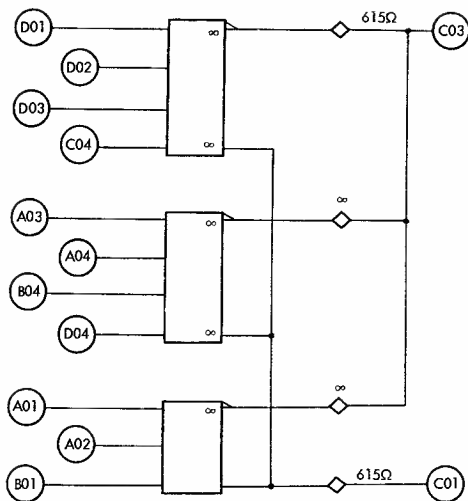   is on, and off when all of its out-of-phase
   transistors are off.

4(4wφ)
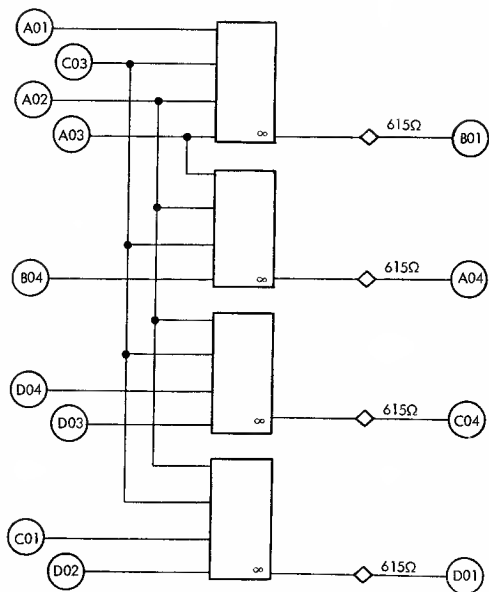
Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

Module   - 2413880
Combined - AMAG8
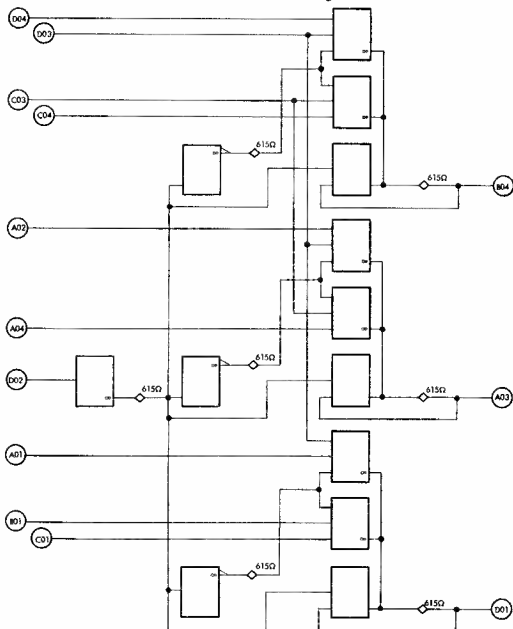Basic    - ALAA0
         - ACARE

(2-4w, 1-3w) AO both $\phi$



Circuit Flyers

| | | | | |
|---|---|---|---|---|
| B02 | −3V | Module | − | 2413881 |
| B03 | +1.25V | Combined | − | AMA38 |
| C02 | GND | Basic | − | ALACA |
| | | | − | ALAAC |
| | | | − | ACARE |

3(2-Turn On Polarity Hold)



Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | - 2413882 |
| B03 | +1.25V | Combined | - AFA38 |
| C02 | GND | | - ALAA8 |
| | | Basic | - ALAA0 |
| | | | - ALACA |
| | | | - ACARE |
| | | | - ALAAC |

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2(3-Turn On Polarity Hold)
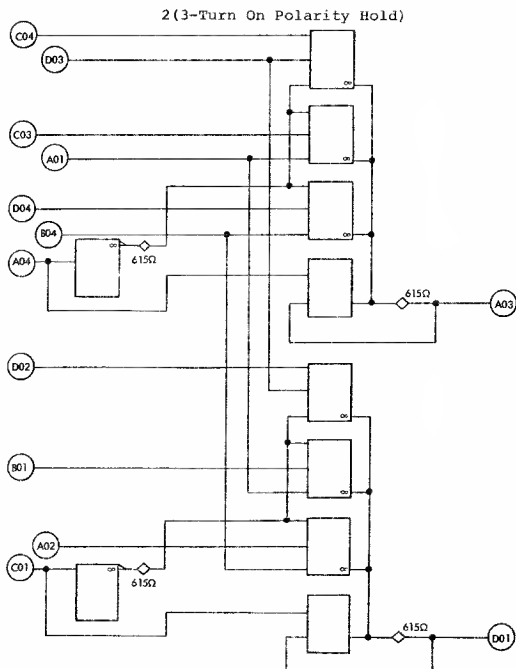


Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | - 2413883 |
| B03 | +1.25V | Combined | - AFA48 |
| C02 | GND | Basic | - ALAA0 |
| | | | - ALACA |
| | | | - ALAAC |
| | | | - ACARE |

4 (Exclusive OR)
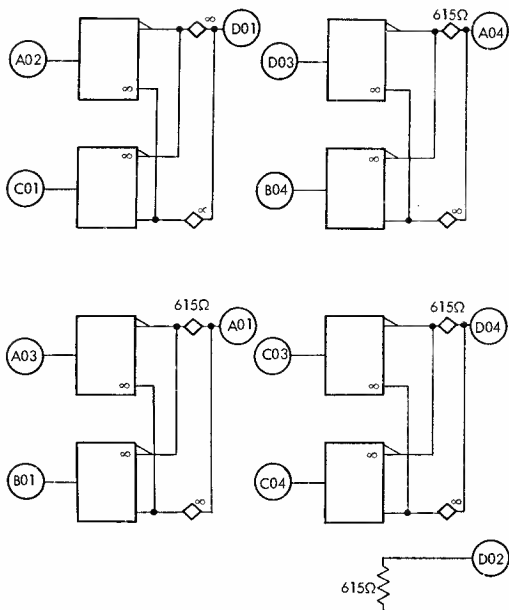
Circuit Flyers

Module    − 2413884
Combined  − AUAE8
          − AUAE0
Basic     − ALAAA
          − ALAAC
          − ALACB
          − ACARE

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3(2-2w AO Latch)
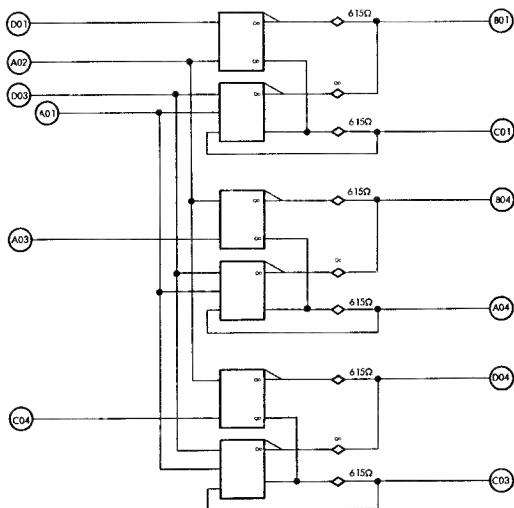


Circuit Flyers

| | | |
|---|---|---|
| B02 | -3V | Module   - 2413885 |
| B03 | +1.25V | Combined - AMA28 |
| C02 | GND | Basic   - ALAAC |
| | | - ALACA |
| | | - ACARE |

6(2w$\overline{\phi}$)
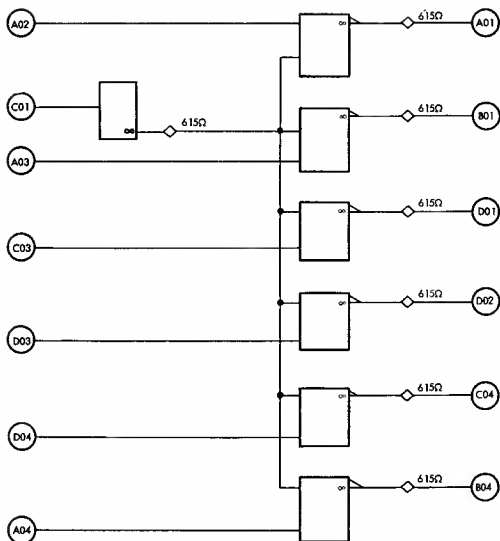


Same as P/N 253 1829, with emitter resistors.

Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | - 2413886 |
| B03 | +1.25V | Combined | - NA |
| C02 | GND | Basic | - ALAA8 |

1(2-3w AO) both φ, 1(2- 2w AO) φ



Circuit Flyers

| B02 | -3V | Module | - 2413887 |
|-----|-----|--------|-----------|
| B03 | +1.25V | Combined | - AMA28 |
| C02 | GND | Basic | - ALACA |
| | | | - ALAAC |
| | | | - ACARE |

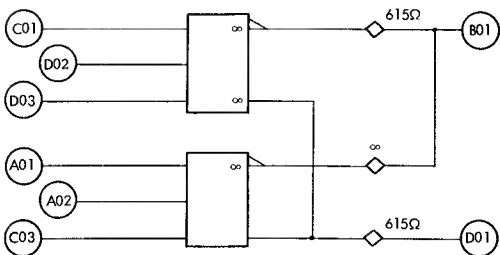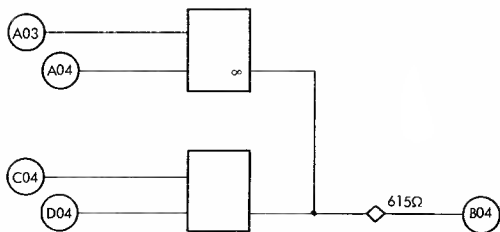THIS PAGE INTENTIONALLY LEFT BLANK

(3-3w, 1-4w) AO both φ
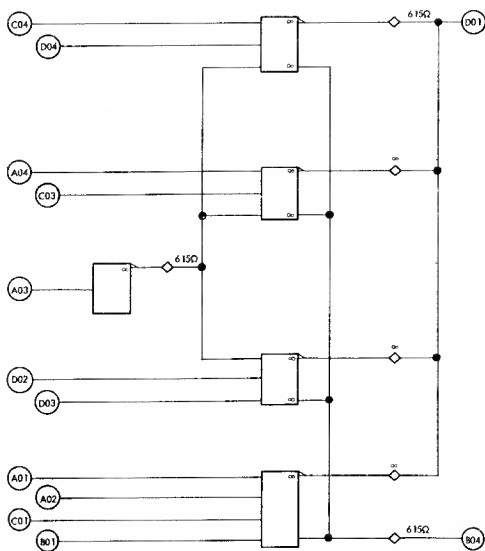


Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

Module   - 2413889
Combined - NA
Basic    - ALAA8
         - AMA48

3-3w both φ



Circuit Flyers
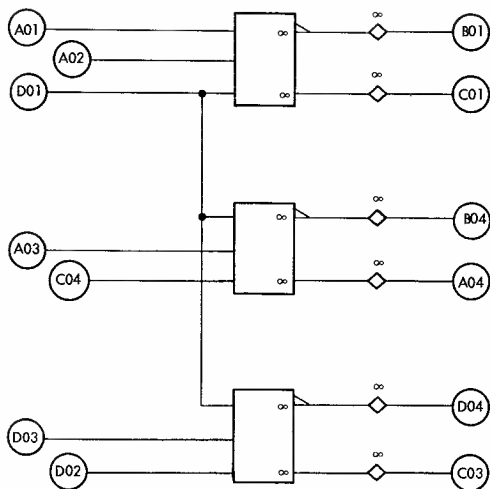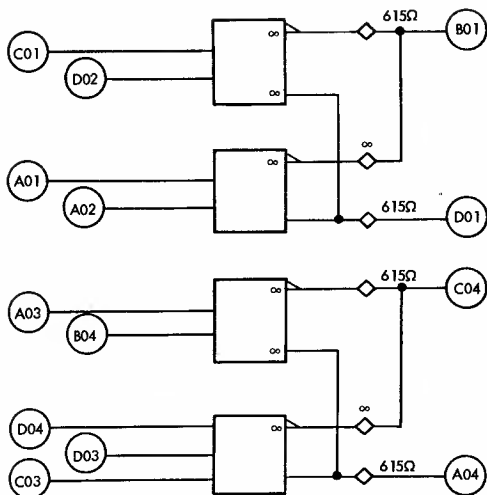
B02  -3V
B03  +1.25V
C02  GND

Module   - 2413890
Combined - NA
Basic    - ALAA0

[1(2-2w) AO, 1(1-2w, 1-3w) AO] both φ



Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | - 2413891 |
| B03 | +1.25V | Combined | - AMA28 |
| C02 | GND | Basic | - ALACA |
| | | | - ALAAC |
| | | | - ACARE |

2-3wφ, 1-4wφ
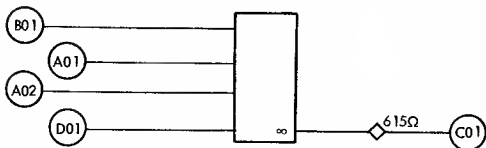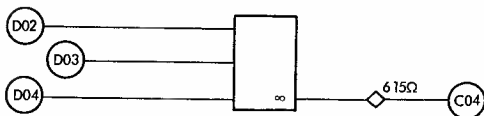


Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

Module   - 2413892
Combined - NA
Basic    - ALAA8

6(2wφ)

A02 — A01 615Ω
C01 — 615Ω
A03 — B01 615Ω
A04 — B04 615Ω
D04 — C04 615Ω
C03 — D01 615Ω
D03 — D02 615Ω
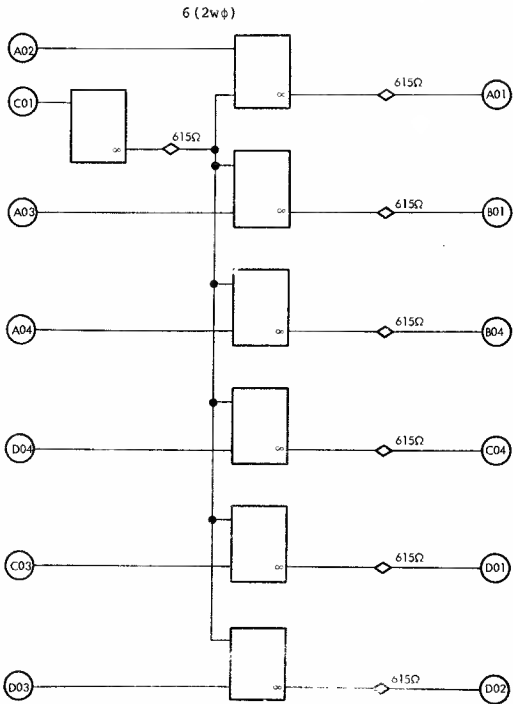
Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

Module   - 2413893
Combined - NA
Basic    - ALAA8

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## 2-Exclusive OR Latch



## Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | - 2413894 |
| B03 | +1.25V | Combined | - AMAE8 |
| C02 | GND | Basic | - ALAA0 |
| | | | - ALACA |
| | | | - ACARE |

Note: The following connections must be made:
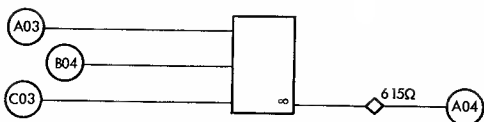
    Tie Pin C04 to B04
    Tie Pin D01 to A03

(3-4w, 1-3w) AO both φ
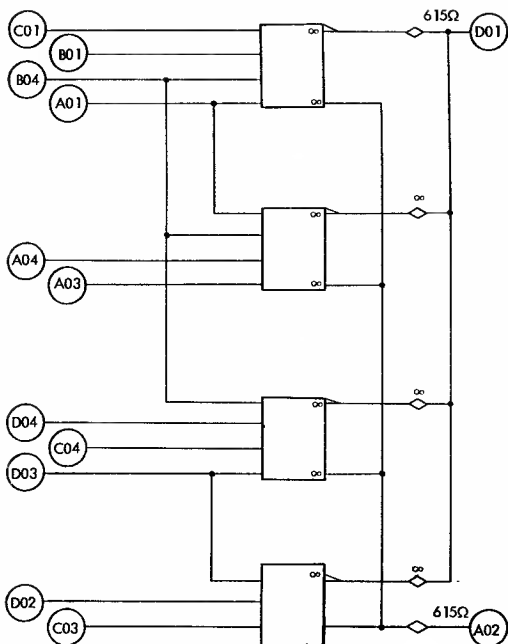


Circuit Flyers

B02  −3V
B03  +1.25V
C02  GND

Module   — 2413895
Combined — AMA48
Basic    — ALACA
         — ALAAC
         — ACARE

(4-3w) AO, 2w$\overline{\phi}$
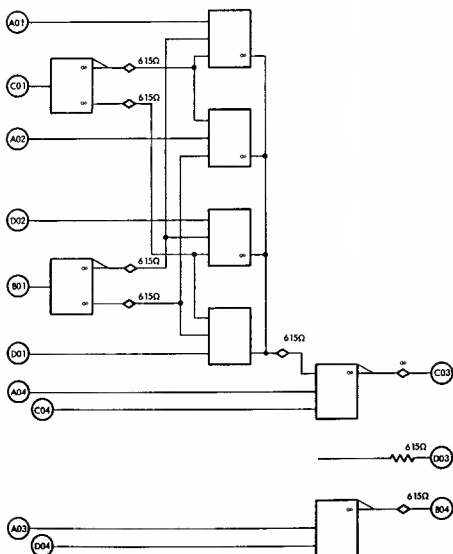


## Circuit Flyers

| | | | | |
|---|---|---|---|---|
| B02 | −3V | Module | − | 2413896 |
| B03 | +1.25V | Combined | − | NA |
| C02 | GND | Basic | − | ALAA8 |
| | | | − | AMA48 |
| | | | − | ALAA0 |
| | | | − | ACARE |

2-D.C. Trigger
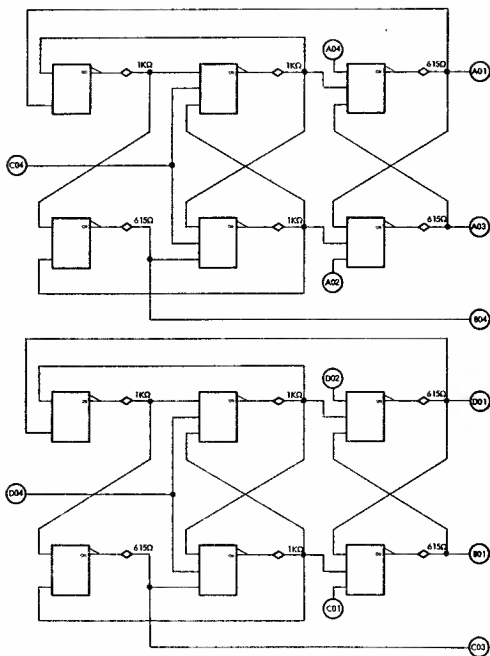


Circuit Flyers

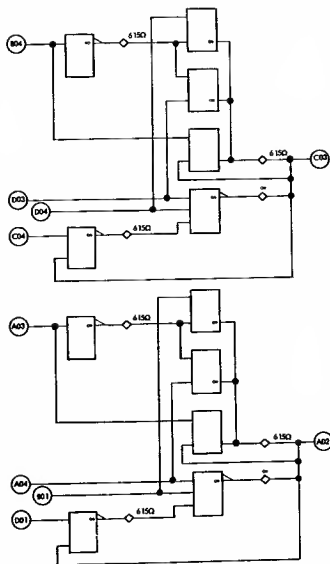| | | | |
|---|---|---|---|
| B02 | −3V | Module | − 2413897 |
| B03 | +1.25V | Combined | − NA |
| C02 | GND | Basic | − AFAA8 |

3(2-3w AO) $\overline{\phi}$
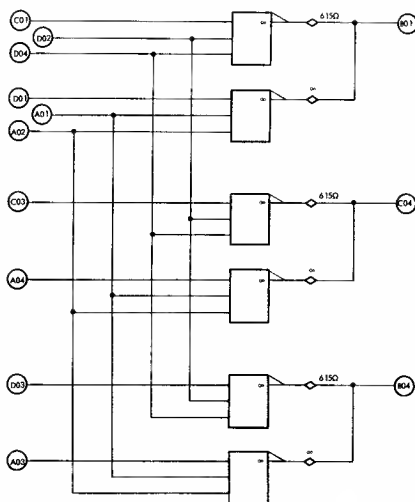


Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

Module   - 2413898
Combined - NA
Basic    - AMA28

(4) Polarity Hold



Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

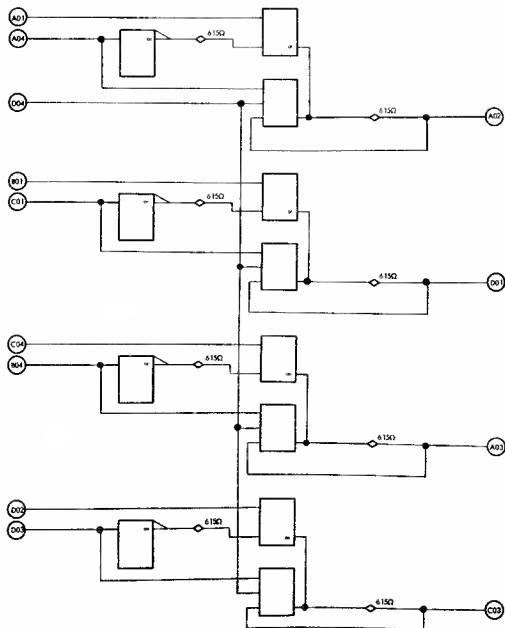Module   - 2413899
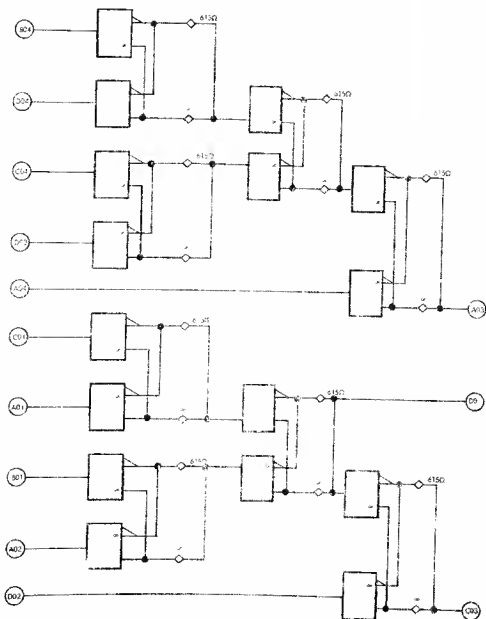Combined - NA
Basic    - AFA28

Notes for Module P/N 2551854 only.

Note 1  Pin D04 actually goes to 4 bases.  Design
        Automation, however, has been told (via
        flyer) that this pin represents only 3 bases.

        This representation is valid for AC wiring
        rule implementation only, and then only
        when the conditions stated below are ful-
        filled.  It is the responsibility of the
        logic designer to assure himself that these
        conditions are met:

        a)  Counting pin D04 as four loads, there
            are not more than ten loads on the net
            involved, and

        b)  It is not necessary that the net, of
            which pin D04 is a part, reach its final
            condition until a time interval, $t_o$, has
            elapsed, after the beginning of a tran-
            sition, where $t_o$ is 3 x L x 0.17 ns,
            where L is the total length of that net
            in inches.

2 4w OE Parity Tree



Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | −3V | Module | − 2413900 |
| B03 | +1.25V | Combined | − NA |
| C02 | GND | Basic | − AUAF8 |
| | | | − AUAE8 |

3(3w both φ)
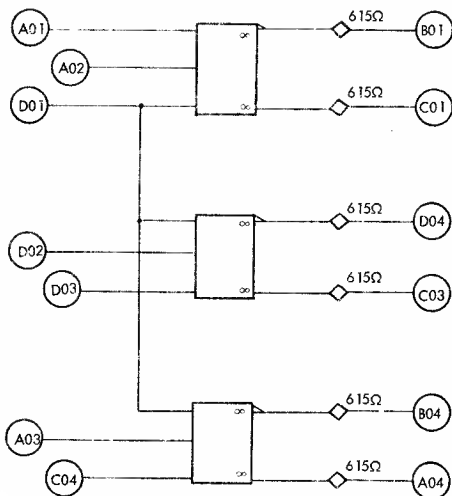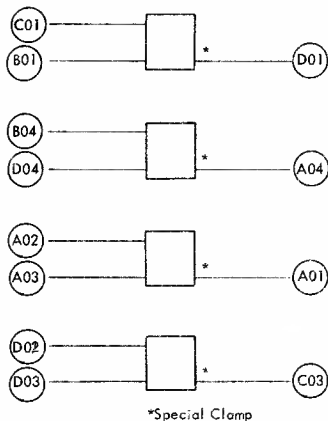


Circuit Flyers

B02  -3V
B03  +1.25V
C02  GND

Module   - 2413901
Combined - NA
Basic    - ALAA8

P/N 2541646   Multi-Purpose φ CS



*Special Clamp

Pd CASE IV = 92.3mw
   ET-1   = 82.0mw

Circuit Flyers

| | MST-1 | MST-2 |
|---|---|---|
| B02 -3V | Module   - 2413869 | Module   - NA |
| B03 +1.25V | Combined - NA | Combined - NA |
| C02 GND | Basic    - XLLGG | Basic    - NA |

Module Part No:  2541646

Power Supplies Required:  Standard MST-1 or MST-2

Input Levels:  MST-1 or MST-2

Output Levels:  Clamped Collector of Common Base
Transistor

Description:  This module provides four in-phase
outputs, each output being the clamped
collector of a common base stage.  The
clamp is implemented by a diode to
+1.25V as shown schematically below.

When used in conjunction with P/N
2551658, conversion can be made be-
tween MST-1 levels and SLT or NPL
levels.*  For MST-2 P/N 2551899 is
required.  The module can also be
used as an indicator driver for the
standard IBM SCRID assembly or other
special applications

In general, this circuit provides a
sink for current into the output.  The
maximum current the output will accept
is 3.15ma.  The maximum voltage which
can be applied to the output of the
circuit without component damage is:

Maximum Positive Voltage    +3.25V
Maximum Negative Voltage    +.535V

The input loading is equivalent to
that of a standard logic block.

*See P/N 2551658
for NPL application



Output

GND

-3V        +1.25V

39
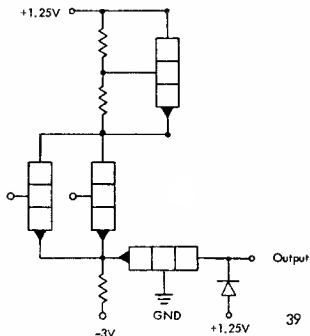
Multi-Purpose ⎡ CS
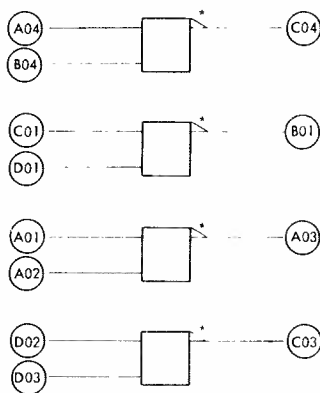


*Special Clamp

Pd CASE IV = 160.0mw
   ET-1    = 138.0mw

Circuit Flyers

|          |        |           |   | MST-1     | MST-2   |
|----------|--------|-----------|---|-----------|---------|
| B02      | -3V    | Module    | - | 2413841   | 2413834 |
| B03      | +1.25V | Combined  | - | NA        | NA      |
| C02      | GND    | Basic     | - | XLHGG     | ALHGG   |

40

Module Part No:  2531647

Power Supplies Required:  MST-1 or MST-2

Input Levels:  MST-1 or MST-2

Output Levels:  Clamped collector of input transistor

Description:  This module provides four out-of-phase
outputs, each output being the clamped
collector of the input transistor.
The clamp is provided by two parallel
diodes to +1.25V as shown schematic-
ally below.

When used in conjunction with the mod-
ule P/N 2551658, conversion can be
accomplished between MST-1 levels and
SLT or NPL levels.*  For MST-2 us, of
P/N 2551899 is required.

The module can also be used as an in-
dicator driver for the standard IBM
SCRID assembly on other special appli-
cations.

In general, the output provides a sink
for current into the output.  The max-
imum current the output will accept is
8.78ma.  The maximum voltage which can
be applied to the output terminal
without component damage is:

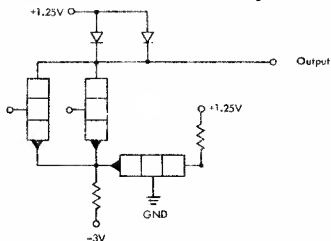    Maximum Positive Voltage   +3.25V
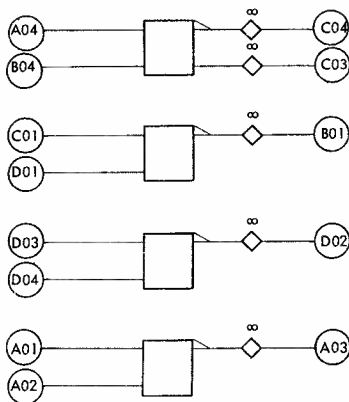    Maximum Negative Voltage   +0.535V

The input loading is equivalent to 2.2
times that for a standard logic block.



*See 2551658 for NPL application

## MST-1 to MST-2 Converter

### 3-2w$\overline{\phi}$, 1-2w both $\phi$



Circuit Flyers

B02  -4V
B03  +1.25V
C02  $V_{REF}$ (MST-1)

Module   - 2413992
Combined - NA
Basic    - ALHCC

Module Part No:  2551648

Power Dissipation:  CASE IV  220.3mw

ET-1     184.6mw

Power Supplies Required:  MST-1 & MST-2

Input Level:  MST-1

Output Level:  MST-1 or MST-2

Description:  In converter applications both MST-1
and MST-2 supply voltages are needed
and the output levels are MST-2.

MST-1 to MST-2 Conversion



MST-1 to MST-2 Conversion     $R_{max}$ =3 ohms

90Ω

P/N2390480

620Ω

100Ω
P/N2390445

-3.0v

## MST-1 to MST-2 Converter

### 2-4w both φ



Circuit Flyers

| | | |
|---|---|---|
| B02 | −4V | Module   – NA |
| B03 | +1.25V | Combined – NA |
| C02 | $V_{REF}$ (MST-1) | Basic    – NA |

Module Part No: 2541649

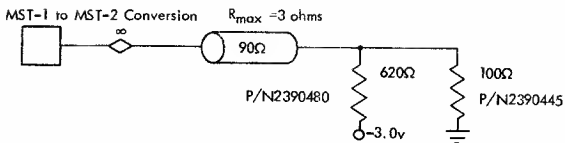Power Dissipation: CASE IV = 133.8mw; ET-1 = 113.7mw

Power Supplies Required: MST-1 and MST-2
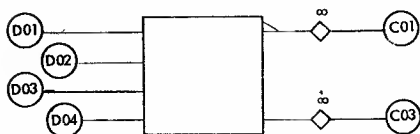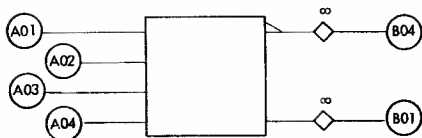
Input Levels: MST-1

Output Levels: MST-1 or MST-2

Description: In converter applications, both MST-1 and MST-2 supply voltages are needed, and the output levels are MST-2.

The circuits contained in this module are equivalent to those contained in module 2551648, the difference between the modules being circuit count and output options. The application and passive component requirements described for the 2551648 module are also applicable to this module.

MST-2 to MST-1 Converter



Circuit Flyers

B02  -4V
B03  GND
C02  $V_{REF}$ (MST-1)

Module  - 2413809
Combined - NA
Basic  - PXVCC

Module Part No: 2551650

Power Dissipation: CASE IV = 282.8mw; ET-1 = 248.0mw
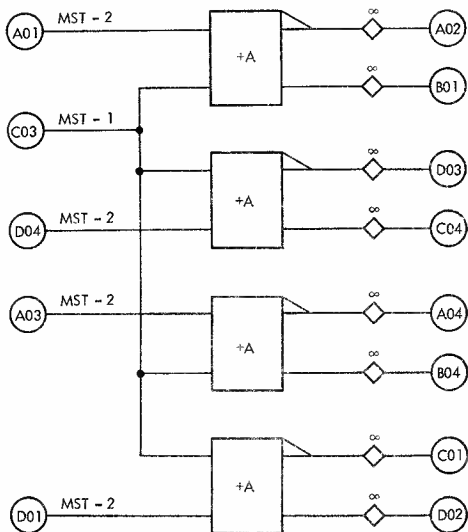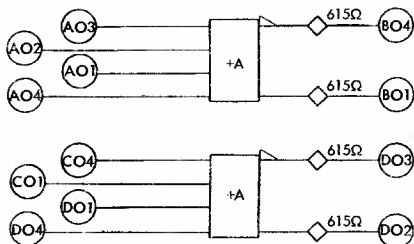
Power Supplies Required: Standard MST-1

Input Levels: MST-1 and MST-2

Output Levels: MST-1

Description: This module provides conversion from
MST-2 to MST-1. Each of the four cir-
cuits performs a positive 'AND' func-
tion between the common MST-1 line,
and an MST-2 line. The output emitter
followers have standard MST-1 logic
driving capability.

## NPL/SLT To MST-1/MST-2 Converter



Pd CASE IV = 267.9mw
ET-1     = 232.3mw

Circuit Flyers

|     | MST-1 | MST-2 MST-4 |          | MST-1 | MST$_{GEN}$ |
|-----|-------|-------------|----------|-------|-------------|
| B02 | -4V   | -3V         | Module   | NA    | NA          |
| B03 | GND   | +1.25       | Combined | XXAAB | PXAAD       |
| C02 | $V_{REF}$ | GND     | Basic    | PCAAH | PCAAH       |
|     |       |             |          | PCCCL | PCCCJ       |
|     |       |             |          | PCCCM | PCCCK       |

Module Part No: 2551651

Power Supplies Required: MST and +6.0 + 10%
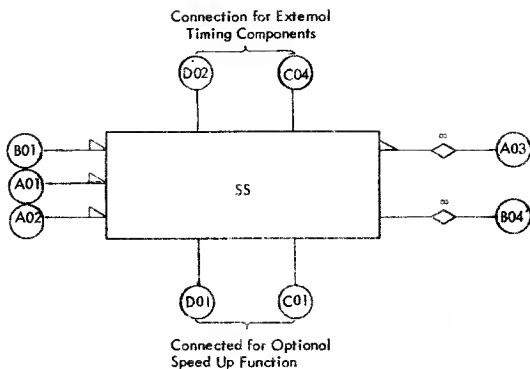
Input Levels: MST, NPL, SLT

Output Levels: MST

Description: This module provides the conversion
between the NPL interface or SLT and
MST. Each module contains two convert
functions which perform a "Positive
And" function on the MST and NPL or
SLT inputs. By appropriate selection
of external R-FACs and R-C-PACs, this
module can be used in MST-1, MST-2, or
MST-4 systems. The circuits are con-
nected to the external components as
shown below:
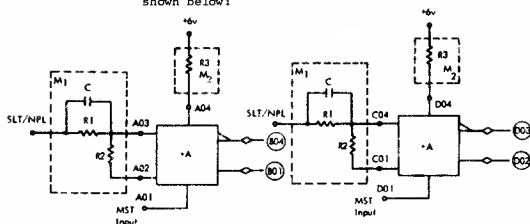


| | $M_2$ | $M_2$ |
|---|---|---|
| MST-1 | P/N 2392344<br>$R_1 = 6.04K\Omega$ $R_2 = 2.35K\Omega$<br>C = 20 pf | P/N 2390525<br>$R_3 = 2.2K\Omega$ |
| MST-2<br>and<br>MST-4 | NPL/SLT-30<br>P/N 2390399<br>$R_1 = 6.04K\Omega$ $R_2 = 10K\Omega$<br>C = 20 pf | P/N 2390507<br>$R_3 = 1.6K\Omega$ |
| MST-2<br>and<br>MST-4 | SLT-10<br>P/N 2392357<br>$R_1 = 5.0K\Omega$<br>$R_2 = 3.0K\Omega$<br>C = 18 pf | P/N 2390507<br>$R_3 = 1.6K\Omega$ |

Single Shot

Connection for External
Timing Components



Connected for Optional
Speed Up Function

Pd CASE JV = 241.2mw
    ET-1   = 206.0mw

Circuit Flyers

B02  -3V
D04  -3V
B03  +1.25V
C02  GND

Module   - NA
Combined - NA
Basic    - ASGAA
         - ASGAF
         - ASGAG
         - ASGAB
         - ASGAC
         - ASGAD
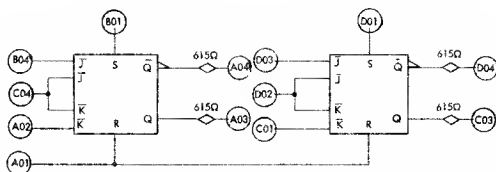
Module Part No:  2551652

Power Supplies Required:  MST-2

Input Levels:  MST-2

Output Levels:  MST-2

Description:  Pulse width from 138ns to 1.19 seconds
obtained by R.C. combinations.  This
is similar except for voltage assign-
ments as noted in Section 19 Book
03-07 MST-1 Circuit Operation.

2 - A.C. Trigger



Circuit Flyers

| | | |
|---|---|---|
| B02 | -3V | |
| B03 | +1.25V | |
| C02 | GND | |

| | | |
|---|---|---|
| Module | - | 2413810 |
| Combined | - | NA |
| Basic | - | PFSAA |
| | - | PFSAB |
| | - | PFSAC |

Module Part No:   2551654

Power Dissipation:  CASE IV = 281.8mw; ET-1 = 241.8mw
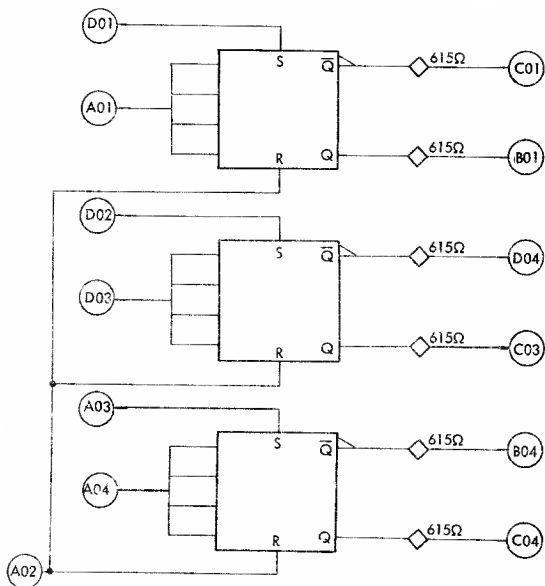
Power Supplies Required:  MST-1 or MST-2

Input Levels:  MST-1 or MST-2

Output Levels:  MST-1 or MST-2

Description:   Positive (one) inputs on a dc input
               will set or reset the trigger.  To
               switch the trigger, both ac inputs on
               one side must be set to their down
               levels for a minimum conditioning
               time, followed by a positive transi-
               tion of one or both inputs.  The out-
               puts can only drive unterminated
               lines in MST-2 environments.

## 3 - A.C. Trigger



Circuit Flyers

| | |
|---|---|
| B02  -3V | Module  - 2413838 |
| 303  +1.25V | Combined - NA |
| C02  GND | Basic  - PFSAA |
| | - PFSAB |
| | - PFSAC |

Module Part No:   2551655

Power Dissipation:   CASE IV = 422.7mw;  ET-1 = 362.7mw
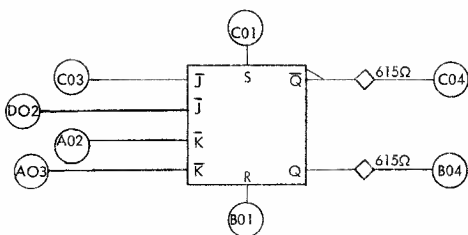
Power Supplies Required:   MST-1 or MST-2

Input Levels:   MST-1 or MST-2

Output Levels:   MST-1 or MST-2

Description:      This module contains three A.C.
triggers with a common reset line.  On
each circuit all the A.C. inputs are
tied together, enabling the circuit to
be used as a counter element.  A posi-
tive transition applied to the A.C.
input will cause the output to switch
states.  Logical one inputs to the 'S'
and 'R' lines will reset the circuit.

The output emitter followers have
standard logic driving capabilities
in MST-1, and can only drive
unterminated lines in MST-2.

A. C. Trigger



Circuit Flyers

|  |  | MST$_{GEN}$ |
|---|---|---|
| B02 | −3V | Module − 2413837 |
| B03 | +1.25V | Combined − NA |
| C02 | GND | Basic − PFSAA |
|  |  | − PFSAB |
|  |  | − PFSAC |

56

Module Part No:   2551656

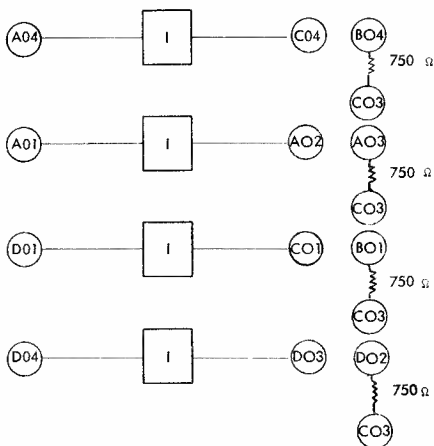Power Dissipation:   CASE IV = 140.9mw; ET-1 = 120.9mw

Power Supplies Required:   MST-1 or MST-2

Input Levels:   MST-1 or MST-2

Output Levels:   MST-1 or MST-2

Description:   For trigger description, see 2551654.

## CS to NPL/SLT Converter



Pd:                          Circuit Flyers

Maximum − 284 mw            Module    − 2413803
Nominal − 138 mw                      − 2413842
                           Combined − NA
                           Basic     − PXAAA
C02  GND                              − PXAAB
C03  +6V                              − PCCBY
                                      − PCCBZ
                                      − PCCZZ
                                      − PCAZZ

Module Part No:  2551658

Power Supplies Required:  +6.0V ± 10%

Input Levels:  Output of MST-1 or MST-2 CS Module

Output Levels:  SLT

Description:  This module provides the conversion be-
tween MST signal levels and SLT.  When
converting to SLT, this module is used
in conjunction with either of the MST-1
modules (2531647, 2541646) or the MST-2
CS module (2551899).  Conversion to NPL
levels may be accomplished by the addi-
tion of an R-PAC (2390306) and a dis-
crete transistor P/N 2391329 (Type 355)
to the output of the SLT converter.
(Refer to TEB 2-6400-100 section 16.5
for description of NPL conversion.)

The resistor shown in the block diagram
is a programmable collector load for
SLT applications.

MST-1 to MST-2 Converter

3-2wφ, 1-2w Both φ
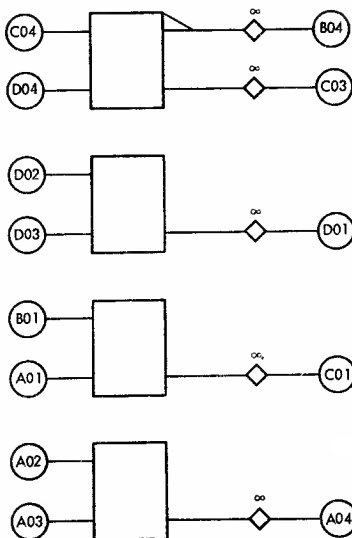


Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | −4V | Module | − NA |
| B03 | +1.25V | Combined | − NA |
| C02 | $V_{REF}$ | Basic | − NA |

Module Part No:  2551665

Power Dissipation:  CASE IV = 246.8mw; ET-1 = 214.0mw
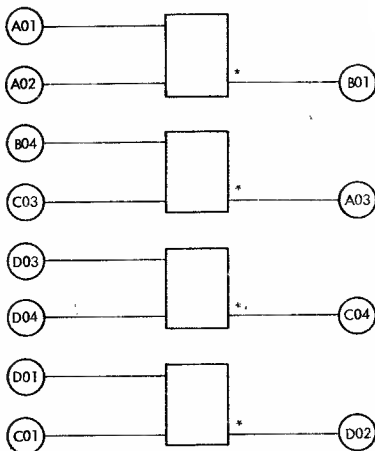
Power Supplies Required:  MST-1 or MST-1 & MST-2

Input Levels:  MST-1

Output Levels:  MST-1 or MST-2

Description:  The circuits contained in this module
provide an in-phase version of module
P/N 2551648.  The application and pas-
sive component requirements described
for P/N 2551648 are applicable to this
part number.

## Multi-Purpose In-Phase CS

### 4(2wφ)



Circuit Flyers

| | | | |
|---|---|---|---|
| B02 | -3V | Module | - 2413847 |
| B03 | +1.25V | Combined | - NA |
| C02 | GND | Basic | - AEAB8 |

*Note: Pins A03, B01, C04 and D02 are coded as emitter outputs "E" for DA Program compatability. They are not standard emitter outputs.

Module Part No:  2551899

Power Supplies Required:  Standard MST-2

Output Levels:  Clamped Collector of Common Base
                Transistor

Description:  This module provides four in-phase
              outputs.

              When used in conjunction with P/N
              2551658, conversion is made between
              MST-2 levels and SLT or NPL levels.
              See P/N 2551658 for NPL application.

              The input loading is equivalent to 2
              times that for a standard logic block.

VIII.  PASSIVE COMPONENT DESCRIPTIONS

| P/N | Description | Where Used |
|---|---|---|

2390381        Ref R Pac        Ref R Pac for Standard Logic Circuits

615Ω All

PINS 1   2   3   4

---
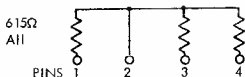
2390383        2 Ref R Pac        2 Ref R Pac for Standard Logic Circuits

1.23Ω All

PINS 1   2   3   4

---
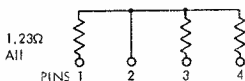
2392338        MST-1 Line Terminator        MST-1 TLD

4

200Ω       200Ω

1 o        o 3

175Ω       175Ω

2
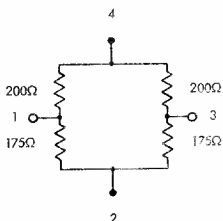
TLD P/N
2551648
2541649
2551652
2551665
2551668

---

2390445                               1/2 of MST-1 to MST-2 Converter Line Terminator

100Ω   100Ω   100Ω

PINS 1   2   3   4

---
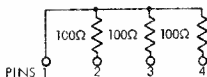
2390480                               1/2 of MST-1 to MST-2 Converter Line Terminator

620Ω   620Ω       620Ω

PINS 1   2   3   4
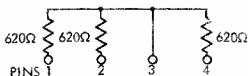
| P/N | Description | Where Used |
|---|---|---|

**2392344**    NPL/SLT to MST-1 Converter

2.35k   6.04k   20pf   PINS 1 2 3 4
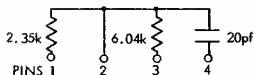
**2390525**    NPL/SLT to MST-1 Converter

2.2k   2.2k   PINS 1 2 3 4
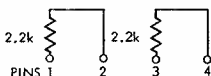
**2390399**    NPL/SLT to MST-2 Converter

10k Ω   6.04k   20pf   PINS 1 2 3 4
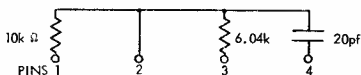
**2390507**    NPL/SLT to MST-2 Converter

1.6k   1.6k   PINS 1 2 3 4
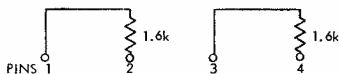
**2390902**    MST to Indicator

360Ω   360   360   360   1 2 3 4 5 6 7 8
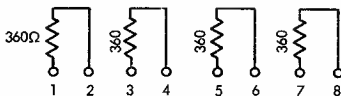
**2392636**    MST to Indicator

32K Ω   32K   32K   32K   1 2 3 4 5 6
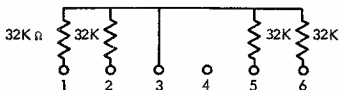
| P/N | Description | Where Used |
|---|---|---|

**2390379** — MST-2 Tie Up



82Ω    95Ω
1   2   3   4

---
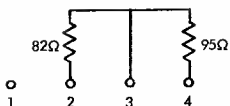
**2390380** — MST-2 Line Terminator



90Ω    90Ω    90Ω
1   2   3   4

---
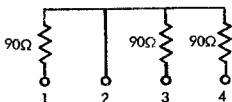
**2392627** — NPL Terminating resistor



95Ω            95Ω
1   2   3   4   5   6

---

**2390306** — MST-2 to NPL



70Ω
1   2   3   4

---
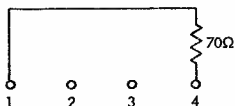
**2390837** — SLT-MST Terminating Resistor



200Ω   200Ω   200Ω   200Ω
1   2   3   4   5   6   7   8
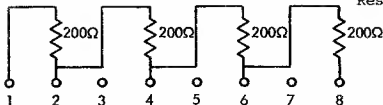
# IX. REFERENCES

| Book Name | Book Number |
|---|---|
| MST-2 Circuit Operation | 03-08 |
| Packaging Ground Rules and Descriptions | 03-10 |
| Design Automation | 00-04 |
| MST-1 Circuit Operation | 03-07 |